

FIFTY YEARS OF THORACIC SURGERY*

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ANESTHESIA, asepsis and antisepsis gave the surgery of fifty years ago a firm foundation upon which to build. Thoracic surgery, of course, shared in the stimulus these three great discoveries gave to experimental and clinical surgery but the advance of thoracic surgery was necessarily held in abeyance until roentgenology was discovered in 1895 and, to a less extent, until bronchoscopy, esophagoscopy, thoracoscopy, bronchography and respiration under differential pressure were still later made available.

These tools are now used almost daily in every active thoracic surgery clinic and are rightly considered as indispensable. While reading many case histories of fifty years ago, I was constantly aware of the overwhelming difficulties the clinicians of that time faced in attempting to determine the nature, size and exact position of intrathoracic lesions without the use of roentgenology and bronchoscopy; and it is not surprising that the scope of thoracic surgery was then greatly limited and that the clinical results were shockingly bad when judged by present-day standards. The difficulty of exact localization of a small or even medium-sized pulmonary abscess for surgical drainage by physical signs alone, without the aid of roentgenology, is apparent to the innumerable surgeons who have experienced difficulty in localizing small abscesses even with the combined use of physical signs, x-ray and bronchoscopy. The problems presented in an attempt to remove an intrabronchial foreign body without the aid of bronchoscopy or roentgenology may readily be appreciated.

So great were the obstacles to progress from the groping thoracic operations of fifty years ago that DeForest Willard, an

American, wrote of "the extreme inherent difficulties and dangers which must be met in our attempts to invade the thorax," and Taeufert, a German, asserted that surgeons were well aware that most operations in the chest, perhaps with the exception of empyema operations, will give only limited results, while Stephen Paget, an Englishman, introduced a book, "The Surgery of the Chest," which he published in 1896, by saying that the time was ripe for the presentation of the valuable facts he had collected "because there are signs that we have reached a stage in this portion of our art beyond which, on our present lines, we cannot advance much further." Manning wrote in 1894, "The lungs were among the last [internal organs] to receive systematic treatment by operations" and he added that such operations were few, having followed experiments on animals or having been undertaken as a last resort in incurable cases. Only William LeMoyne Wills, professor of descriptive and surgical anatomy at the University of Southern California, among the authors whose writings of fifty years ago I have read, expressed an optimistic opinion about the future development of thoracic surgery, predicting that with improvements in surgical methods the successful partial lobectomies he carried out experimentally on animals would, within ten years, be justifiable in man and that they would be as successful as ovariectomy, when performed by competent surgeons.

It is of interest that fifty years ago (1890) David W. Cheever published an article, "Old and New Surgery," in the Boston Medical and Surgical Journal, in which he discussed with justifiable satisfaction the great surgical progress that had been made

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during the preceding fifty years. He spoke with gratitude of the boon of anesthesia and antisepsis, which had been introduced during that fifty-year period, and of their enabling a surgeon to operate without haste and without fear of the terrible consequences of a gravely infected wound. He pointed out the frequency with which pyemia, phlebitis, erysipelas and prolonged wound suppuration followed the operations of that earlier period, the frequent necessity of amputation for infected compound fractures, and the use of a stab incision for the division of a constricting hernial ring because of the virtual certainty that an open dissection would cause suppuration.

The tremendous progress that has been made in thoracic surgery during the last fifty years is indicated by the limited scope of the surgery of the chest at the beginning of this period and the fact that now virtually every disease affecting the chest has been successfully operated upon. When the American Journal of Surgery was established fifty years ago thoracic surgery was limited to the treatment of injuries, pleural and pericardial empyema, necrosis of bone, abscess of the lung, neoplasms of the thoracic wall, drainage of tuberculous cavities and hydatid cysts, dilatation of esophageal strictures and the removal of intrabronchial foreign bodies.

The advances that have been made during the last fifty years in the whole field of the medical sciences have been of particular service to thoracic surgery, enabling it to solve problems that had scarcely been seriously considered fifty years ago. The results of treatment of every surgical disease of the chest have been vastly improved during this fifty-year period. Only did the management of empyema begin to approximate the modern treatment of this condition.

EMPYEMA

The articles published in 1890 and 1891 reveal a strong body of opinion opposed to the then recently prevalent practice of not interfering with an empyema, in the hope

that spontaneous absorption of the pus would occur, and an almost equally strong body of opinion opposed to the indefinitely prolonged needle aspiration of pus.

Although the diagnosis of empyema was largely based upon the auscultatory and other well known methods of physical examination, several physicians published pleas for the frequent early use of exploratory needle aspiration as a diagnostic measure in doubtful cases, rightly reasoning that early diagnosis and the early institution of adequate treatment would greatly improve the end results. Goggans, an American, cited his own experience of 168 aspirations of the pleural cavity for a variety of purposes, without ill effect. He aspirated one empyema seventy-three times before he realized that tube drainage was necessary!

As long as fifty years ago several surgeons recognized the fundamentally important fact that needle aspiration of the pleural fluid during the early days of an empyema gave time for the formation of firm pleural adhesions at the limits of an empyema cavity that had been reduced in size by the aspirations. When surgical drainage was carried out after these adhesions had formed, only a localized abscess cavity, not the entire free pleural cavity, was opened. Early drainage of an infected free pleural cavity is notoriously dangerous and is likely to lead to chronic empyema. These sound principles were largely lost sight of until they were firmly established on experimental grounds and well publicized at the time of the World War by the Empyema Commission of the United States Army, of which Commission Evarts A. Graham was the chairman.

In the early 1890's, as in 1940, there was little agreement as to the best type of surgical drainage and, incidentally, there was much discussion as to whether antiseptic irrigations were valuable or dangerous. A few surgeons advocated only intercostal incision. In this country many advocated the use of a tube in an intercostal incision, while abroad the majority of surgeons pre-

ferred the resection of a part of a rib followed by tube drainage. In Germany there was strong support of Bulau's water-seal tube drainage through an intercostal incision, although some surgeons complained of the frequency with which the small tube became occluded by fibrin and débris. One surgeon held open a drainage wound with hooks that were kept taut by an attached rubber tube passed around the chest.

In order to determine the lower posterior limit of an empyema, Kuster made a small anterior incision through which he probed the cavity for the best site for dependent drainage, but the simpler method of determination of this site by aspiration was already known, as was the fact that a postoperative elevation of the diaphragm might occlude a drainage tube that had been placed too low.

With regard to the treatment of tuberculous effusions and empyemas there was no unanimity of opinion and no conception of the fact that different types of empyema required different forms of treatment. Chronic tuberculous and nontuberculous empyema was often well handled by an Estlander or Schede type of thoracoplasty if prolonged adequate drainage had failed to bring about a cure.

Although certain writers of fifty years ago understood some of the principles of treatment of empyema, only Rickman Godlee of England, among the authors I have read, seems to have understood the disease so well that he managed his cases of empyema much as we do today. We now recognize the importance of early diagnosis, and of aspiration until firm adhesions have formed which localize the pleural abscess. We then resect a portion of a rib at the bottom of the empyema cavity, usually in the posterior axillary line, and make an incision through the bed of the rib only large enough to admit snugly a tube as wide as one's thumb, the outer end of this tube being placed beneath water in a jar. If this air-tight, negative-pressure type of drainage does not soon cause expansion of the lung and complete obliteration of the

cavity, an increase in the negative pressure by means of a pump is likely to do so.

PULMONARY ABSCESS

The difficulties involved in distinguishing pulmonary abscess from bronchiectasis or empyema with bronchopleural fistula, and in exactly localizing an abscess, before x-rays were available, as well as the relatively primitive surgical technic used, made the surgical treatment of pulmonary abscess very unpopular. Among those surgeons who collected the records of the known cases of surgical drainage, Runeberg, a German, found the largest number—forty. Fewer than half of these patients were cured or improved. Willard found the outcome had been successful in six of thirty collected cases; Slawyd found three recoveries among thirteen cases and Seitz four among nineteen. Gaston wrote in 1890 that there were thirty-six cases on record and that "When S. Seabury Jones encountered his first case nine years ago, he was unable to find any reference to the subject whatever in any of the text books. His second case was observed in 1886."

The effect of the difficulty in exactly localizing an abscess was to postpone drainage until the patient had become septic or until the abscess had become so large that it could be readily localized by aspiration. At this time the prognosis was obviously bad in a great majority of the cases. Localization and drainage of secondary abscesses were rarely, if ever, undertaken. Godlee stated that (in such late cases) surgical drainage produced improvement only to a certain point and that hemorrhage, cerebral abscess or other complications might then occur, or that the patient would have to use a drainage tube indefinitely.

Godlee recognized the danger that a diagnostic aspiration might cause an empyema if pleural adhesions were not complete at the site of the aspiration. He recommended the suturing of the lung to the thoracic wall if adhesions were not found at the time of operation.

The technic of drainage was variously performed. With or without the resection of a part of a rib, needle aspiration was followed by the introduction of a scalpel, trocar or other instrument into the abscess. A tube was then introduced into the abscess, perhaps after enlargement of the track with a finger or forceps.

Probably the greatest advance made during the last fifty years in the treatment of pulmonary abscess was the accuracy of diagnosis and localization made possible by x-rays. This accuracy has increased to the present time with the widening appreciation of the value of lateral and oblique, as well as postero-anterior, projections of the x-rays that has occurred. Bronchoscopy has made an important contribution to the determination of the segment of the lung occupied by the abscess, and in the detection of foreign bodies, bronchial neoplasms and other forms of bronchial occlusion, which are not rare etiologic agents.

Bronchoscopy and postural drainage have proved successful in the nonsurgical treatment of a small group of patients and, through the teaching of Neuhof, increasing recognition has been granted to the value of very early surgical drainage of a pulmonary abscess in which a brief trial of nonsurgical measures has failed. Accurate localization makes possible adequate drainage after the removal of a short segment of only one rib and, as pleural adhesions are often present where the abscess is most superficial, a one-stage operation is often possible. These recent advances in diagnostic methods and surgical technic have improved the results of treatment tremendously.

PULMONARY TUBERCULOSIS

Fifty years ago the treatment of pulmonary tuberculosis was fumbling and wholly inadequate. The sanatorium principle had been proposed but not widely adopted. Koch had recently discovered the tubercle bacillus and there was great enthusiasm over the possibility of a cure of the disease with tuberculin. Inhalations

of chlorine gas, insufflations of chloride of gold and sodium and subcutaneous injections of iodoform or creosote were variously tried. Weak solutions of tincture of iodine, carbolic acid, silver nitrate, corrosive sublimate, salicylic acid and other chemicals were injected directly into tuberculous lungs, or into tuberculous cavities after aspiration of their contents. Some physicians found such treatment useless, while others found occasional symptomatic improvement.

Mosler, in Germany, and de Cérenville, in Switzerland, revived an interest in the surgical drainage of tuberculous cavities but, apart from a few cases of symptomatic improvement, the results proved to be disappointing. During the last few years relatively good results have been obtained from drainage (by direct incision or by a catheter introduced by means of a trocar and cannula) of certain types of cavity, particularly that in which the draining bronchus has become obstructed.

During the last fifty years the greatest advances in the treatment of pulmonary tuberculosis have been through the universal adoption of collapse therapy and of the sanatorium, and through efforts to supply a sufficient number of sanatorium beds to meet the demand for them. Although Forlanini's first publication recommending pneumothorax appeared in 1882, and de Cérenville's report of his first "relaxing thoracoplasties" appeared in 1885, an active interest in collapse therapy did not arise until approximately thirty years ago. The first extensive thoracoplasty, that of Brauer and Friedrich, was performed in 1907; the improved Wilms-Sauerbruch modification was introduced in 1911; the modern type of thoracoplasty was not performed until 1928.

Open thoracotomy for the division of offending pleural adhesions in cases of pneumothorax was proposed by Friedrich in 1908, and the operation of closed intrapleural pneumonolysis by means of a thoracoscope was introduced by Jacobaeus in 1913. Paralysis of the diaphragm

through operations on the phrenic nerve was introduced by Stuerz in 1911. Tuffier, in 1893, performed an extrapleural pneumothorax operation, which was sporadically repeated by others until the operation was revived without enthusiasm by Nissen in 1931, and with enthusiasm by Monaldi in 1933. The extrapleural separation of the lung from the thoracic wall and the filling of the space created between them with gauze was carried out by Sarfert in 1901; Tuffier used a filling of a free fat graft in 1910 and Baer used a paraffin mixture in 1913.

A sound knowledge of the effect of these operations upon the different types of tuberculous lesions was acquired slowly, as was a proper evaluation of the inter-relationship between the different operations, and their usefulness or limitation in the management of bilateral lesions. Only during the last ten or twelve years has collapse therapy been used in the leading sanatoria of the world with a full appreciation of its value and limitations, and with the production of astonishingly good results. The number of patients so treated has been too small, in relation to the total number of patients treated for tuberculosis, greatly to affect the tuberculosis death rate. It is probable that the death rate will be greatly reduced when all sanatoria use collapse therapy with maximal efficiency.

THORACIC WALL NEOPLASMS

Operations on thoracic wall neoplasms were performed rather frequently fifty years ago. Little mention was made of benign lesions and, apparently, most were sarcomas. The successful removal of some huge tumors of the ribs or sternum was reported, as well as a considerable number of surgically fatal cases. Among the articles of that period, I note that the surgeons often used an open drainage tube in the thoracic wall after an operation that opened the pleural cavity for an uninfected lesion, and I suppose that some of the deaths were due to a "sucking pneumothorax" that resulted from the presence of

the tube. A better understanding of thoracic physiology has led to the tight closure of such wounds or, if drainage should be necessary, to the use of an airtight, water-seal drainage system. The greatly improved results that have been produced in recent years in the treatment of neoplasms of the thoracic wall have been due not only to the technical improvement just mentioned but to the early diagnoses and operations that the universal use of the roentgen rays has favored.

INTRATHORACIC NEOPLASMS

The difficulty of diagnosis of intrathoracic neoplasms before the first clinical use of the roentgen rays in 1896, and of bronchoscopy and esophagoscopy still later, had the effect of making the surgical treatment of such lesions relatively rare. Diagnosis depended upon the clinical history, physical signs and needle aspiration. The material recovered by aspiration, whether solid or fluid, might lead to a diagnosis. Little was published about neoplastic tumors of the lung and mediastinum and there was a general feeling that the great majority were either sarcomas or carcinomas, for which surgical success would be only a matter of luck, and the only routine treatment for which was the aspiration of a complicating pleural effusion. The drainage of an occasional dermoid cyst was reported and, incidentally, hydatid cysts were operated upon with relative frequency. About fifty years ago Phillips collected 138 cases of hydatid cyst of which thirteen were operated upon with nine recoveries and four deaths; he found that almost all those not operated upon, or merely aspirated, died.

In an 1892 issue of the British Medical Journal, Rickman Godlee wrote as follows: "Amongst a good many cases of cancer of the lung or mediastinum, I have never yet met with one that at all suggested the possibility of removal by operation. Such operations have, however, been suggested, but the circumstances under which there can be even a chance of success must be

exceedingly rare; and thus—although, in animals, portions of lung may be ligatured off and removed without producing any very serious symptoms, I do not think this is at all a promising branch of surgery” and, in 1894, J. A. Manning wrote, “Tumors, which are so eagerly attacked everywhere else, are respected when they involve the lung, save only those with fluid contents.” In 1883, however, Kröenlein successfully removed a portion of a lung containing a walnut-sized recurrent sarcoma six months after having resected the huge primary tumor from the thoracic wall, and in 1891 Tuffier successfully resected the apical portion of a man’s lung for a tuberculous lesion. Several indirect references were made during this period to the successful removal of the traumatically herniated portion of a lung. William LeMoyne Wills, of Los Angeles, learned from W. W. Keen, Roswell Park, Senn and Fenger in 1892 that none of them had ever removed a part of a lung, except in cases of traumatic pulmonary herniation, abscess “or similar condition.”

A number of surgeons occupied themselves fifty years ago with the experimental removal of portions of a lung. Bogliano, Patek and Sailer, of Philadelphia, undertook to remove whole lobes from dogs but the animals died from gangrene of the stump and empyema. They succeeded, however, in three partial lobectomies and one total lobectomy by drawing the part of the lung to be resected out of the chest through a very short intercostal incision and suturing the stump of the resected part in the intercostal incision. Tuffier’s experiment, reported in 1891, is especially noteworthy. In a dog he resected two-thirds of the superior lobe of the right lung and six days later one-third of the superior lobe of the left lung, suturing the stumps into the incisions in the intercostal muscles. He killed the dog seventeen days after the first operation and found complete pleural adhesions around the right-sided stump and complete, but less well organized, adhesions on the left side; no pneumothorax re-

mained, the thorax being completely filled by the remaining portions of the lungs.

At approximately the same time Quenu and Hartmann proposed, on the basis of human cadaver experiments, the paravertebral resection of two-centimeter lengths of the third, fourth and fifth ribs as affording a better surgical approach to lesions in the dome of the thorax than the usually proposed infraclavicular incision. Although this incision had not then been used in man, it has been rediscovered a number of times during the last fifty years. A still greater contribution to the future successful surgical management of intrathoracic neoplasms and other conditions, was the report by Tuffier and Hallion, in 1896, of their animal experiments in preventing collapse of the lung by the use of chloroform insufflation through an intratracheal tube introduced through the larynx. They found that this procedure enabled them to operate on the esophagus, vagus and sympathetic nerves and other intrathoracic structures without upsetting the pulmonary circulation. This discovery is one of the vitally important foundations upon which the successes of modern thoracic surgery have been built, and yet it was not put to clinical use until many years later.

The first successful removal of an entire lobe of a lung in man was accomplished by Körte in 1907. The patient was suffering from bronchiectasis; Körte first removed the right lower lobe and, as pulmonary secretions continued, later removed a part of the right middle lobe and the patient made a complete recovery from his disease. Another dramatic advance was made in 1931 when Nissen, of Berlin, successfully removed an entire bronchiectatic lung; the second successful total pneumonectomy was that of Cameron Haight, of Ann Arbor, in 1932. The following year Evarts Graham was the first successfully to remove an entire lung for carcinoma; the patient is now, more than seven years after the operation, well and free from any evidence of recurrence. Graham’s successful case represented the first curative treatment of

cancer of the lung in the history of medicine and during the last seven years has hugely stimulated an interest in the early diagnosis of cancer of the lung.

While the removal of benign and malignant neoplasms of the lung and mediastinum was a great rarity fifty years ago, it is a commonplace occurrence today in active thoracic surgery clinics, where the mortality rate is surprisingly low and the percentage of cures high. Such an advance has been made possible by the use of diagnostic roentgen rays, endoscopy, differential pressure anesthesia and, importantly, a proper appreciation of thoracic physiology in relation to the preoperative, operative and postoperative care of patients requiring large intrathoracic operations.

HEART AND PERICARDIUM

Fifty years ago a number of successful cases of aspiration of, or drainage of, effusions or empyemas of the pericardial cavity were reported and J. McF. Gaston wrote, "Surgery has thus, with impunity, invaded the citadel of life." F. P. Porcher, however, complained that, "Throughout the country a vast number of cases [of pericardial effusion] escape detection and treatment, either medical or surgical." Unfortunately this is still true today, in spite of the advent of the x-ray, because a pericardial effusion or empyema is often not thought of as a complication of a serious illness and is not recognized until an autopsy is performed.

Although fifty years ago pathologists had found evidence of healed wounds of the heart, I know of no record of that time in which suture of a cardiac wound had been attempted. Roberts made a strong plea for the making of an attempt but Paget expressed his opinion that suture was not practical because, he believed, small wounds do not need suture and large ones would kill the patient before suture was possible. Rehn, however, in 1897, successfully sutured a cardiac wound in a man who apparently was about to die. In succeeding years a large number of wounds have been

successfully sutured in patients desperately ill of loss of blood or cardiac tamponade.

Dramatic advances, such as were not dreamed of fifty years ago, have been made in cardiac surgery during recent years. In 1923, Elliott Cutler divided the two leaves of a stenotic mitral valve. Although this operation has never been successfully repeated, Cutler's first patient survived the operation, was clinically improved and lived for several years. A considerable number of successful pulmonary embolotomy operations have been reported since Kirschner's first successful case in 1924. Sauerbruch, in 1931, resected an aneurysm of the right ventricle, "the size of a child's head," and three and a half months later the patient appeared to be entirely well. A large number of cures of constrictive cardiac disease by the operation of pericardiectomy have been produced during the present century. The experimental and clinical work of Claude Beck during recent years in coronary disease and cardiac contusion is outstanding; as is well known, the various operations he has devised in order to improve the blood supply of the myocardium, has given great relief to a number of patients suffering from grave coronary occlusion. The successful ligation of a patent ductus arteriosus by Gross and Hubbard, in 1938, was soon followed by a considerable number of similar successful operations by Jones and Dolley, and by others.

FOREIGN BODIES IN THE BRONCHI

Before x-rays were available the localization of foreign bodies, especially those in the bronchi, was difficult and inaccurate, being dependent upon physical signs and, at the time of operation, upon palpation by probing. Fifty years ago, before bronchoscopy became available, the removal of those foreign bodies that could be localized was obviously difficult and the attempt frequently failed. As some foreign bodies can be expelled either through the rima glottidis or through a tracheotomy incision, and as some patients with bronchial foreign bodies

are not acutely ill, there was an inclination not to attempt removal unless the situation was desperate, or at least until pneumonia, or pulmonary abscess or gangrene seemed imminent. Removal was undertaken by means of various types of forceps, hooks and spoons introduced through a tracheotomy incision. In one case a long corkscrew was made to engage an impacted cork but its removal proved impossible. DeForest Willard, in 1891, carried out experiments on dogs in order to determine whether it would be feasible to remove intrabronchial foreign bodies by means of a transpleural approach and an opening of the bronchus in the hilum of the lung. He found the risk of severe hemorrhage enormous, and that leakage of air from the incised and sutured bronchus lead to tension pneumothorax after closure of the chest; most of the dogs he operated upon died.

With the advent of x-rays and bronchoscopy and the development, chiefly by Chevalier Jackson, of ingenious instruments for the grasping of all sorts of foreign bodies, attempted removal of foreign bodies has become highly successful and safe. When the procedure is carried out before serious pulmonary infection has developed, the patients usually recover completely. Rarely, foreign bodies become lodged in a part of the lung that is inaccessible by bronchoscopy, or become so firmly imbedded by scar tissue in accessible bronchi that they cannot be dislodged with safety. In such cases, the peripheral foreign bodies may be removed by pneumotomy, but those in large bronchi may require partial or total lobectomy, which may also be required because of a severe complicating bronchiectasis.

ESOPHAGUS

Fibrous or carcinomatous stricture of the esophagus was well managed fifty years ago by bouginage or intubation. As esophagoscopy was not then available, however, instrumentation was carried out in difficult cases through an esophagostomy opening. Obviously, the removal of foreign bodies in the esophagus was infinitely more difficult

than it is at present with the aid of x-rays for localization and the esophagoscope for direct inspection during the seizure of the object with specially designed instruments.

One of the most fascinating accomplishments of modern surgery was the successful completion of an antethoracic esophagus, built of skin and jejunum, by Herzen, in 1907, for a patient who had an impassable esophageal stricture. Four weeks after operation the patient was able to eat bread, chopped meat, eggs, et cetera, passing these foods through the surgically constructed tube in front of the chest into the stomach.

Another dramatic operation was the successful removal of a cancerous esophagus in 1913 by Franz Torek. The esophagus was divided well below the neoplasm, the lower divided end was invaginated and the neoplasm and upper thoracic esophagus were dissected from the mediastinum and drawn out of an incision in the anterior cervical triangle, where the tumor and redundant esophagus were cut off and the esophageal stump sutured to the skin. In 1925, Torek reported that more than eleven years after operation the patient, then seventy-eight years of age, was all right and happy, and that any food that was cut or chewed into a finely divided state passed through the rubber tube that was used to connect the cervical esophagostomy and the gastrostomy openings.

CONCLUSION

Even the factual narration of the changes in surgical procedure that have taken place in a selected group of thoracic conditions does not adequately express the tremendous advance that has taken place in the practice of thoracic surgery during the last fifty years. The most striking change has not been the improvement in the technic of individual operations but the fact that today operations are being successfully performed in great numbers for almost every disease affecting the thoracic organs, whereas fifty years ago thoracic operations were relatively rare and were limited to the treatment of a very few conditions.